Lateral Collateral Ligament Reconstruction Protocol PHASE 1

THE KNEE RESOURCE
RELIABLE KNEE INFORMATION

Monitor for evidence of serious pathology:

- ⚠ Infection
- ⚠ Distal neurovascular deficit (*DVT, AECS, CPN* involvement)

Goals:

- **Protect the graft**
- **Control pain and swelling/effusion**
- **Restore/preserve range of motion**
- **Muscle activation**
- **Normal gait and movement patterns**

Post-operative time-based restrictions:

- ⚠ Knee ROM limited to 0-90˚ for **2 weeks**
- ⚠ PWB (40% bodyweight) for **6 weeks**
- ⚠ Brace to be worn at all times for **12 weeks**
- ⚠ Avoid hyperextension, external tibial rotation, posterior tibial sag and varus for **16 weeks**
- ⚠ Avoid open chain isolated hamstrings exercises for **16 weeks**
- ⚠ Avoid breaststroke, side stroke and whip kicking action in pool for **16 weeks**
- ⚠ Avoid running for **20 weeks**
- ⚠ Progressive return to play if confirmation of stability on stress X-ray at **6 months**

Phase 1 rehabilitation:

- *PEACE* protocol for management of pain and swelling/effusion
- Patella mobilisation if required (medial/lateral, superior/inferior)
- TAQ's, SLR in brace until able to perform without extension lag
- ⚠ Passive/active assisted ROM 0-90˚ for **2 weeks**, FROM thereafter (avoiding hyperextension)
- ⚠ Static bike with no resistance from **2 weeks** once sufficient ROM, increasing time as able
- ⚠ PWB (40% body weight) for **6 weeks** using long lever brace initially (locked at 0˚)
- ⚠ If able to SLR without extension lag, change long lever brace to Össur *CTi* brace at **2 weeks**
- ⚠ Wean off crutches from **6 weeks** if normal gait. Aim for FWB in CTi brace from **8 weeks**

Criteria for progressing to Phase 2:

- Closed wound
- No/minimal pain with phase 1 exercises
- No/minimal synovitis/effusion
- Normal patellofemoral mobility, tibiofemoral ROM ≥0-120°
- Voluntary quadriceps contraction
- Normal FWB gait (from 6-8 weeks post-op)

AECS: Acute extremity compartment syndrome
CPN: Common peroneal nerve
CTI: Össur CTi (carbon titanium) brace
DVT: Deep vein thrombosis
PEACE: Protection, Elevation, Avoid anti-inflammatories, Compression, Elevation.

Lateral Collateral Ligament Reconstruction Protocol PHASE 2

THE KNEE RESOURCE
RELIABLE KNEE INFORMATION

Goals:

- **Protect the graft**
- **Full patellofemoral and tibiofemoral ROM**
- **Correct movement patterns during exercises**
- **Increase muscular endurance**
- **Protected lower limb strengthening**
- **Wean off brace**

Post-operative time-based restrictions:

- ⚠ Brace to be worn at all times until **12 weeks**, then wean off as able
- ⚠ Avoid hyperextension, external tibial rotation, posterior tibial sag and varus for **16 weeks**
- ⚠ Avoid open chain isolated hamstrings exercises until **16 weeks**
- ⚠ Avoid breast stroke, side stroke and whip kicking action in pool until **16 weeks**
- ⚠ Avoid running until **20 weeks**
- ⚠ Progressive return to play if confirmation of stability on stress X-ray at **6 months**

Strength:

- Double leg CKC ex's, progress to single leg as appropriate
- Increase load on the quadriceps, gluteal and calf muscles
- Decrease repetitions and increase resistance for all strength exercises
- ⚠ Double leg bridging from **week 10**
- ⚠ Start open chain isolated hamstrings exercises from **16 weeks**

Neuromuscular training:

- Double leg proprioceptive exercises (e.g. Bosu ball)
- Increase difficulty of double leg proprioceptive ex's (e.g. perturbations, two motoric tasks)
- Control of knee varus and tibial external rotation at lower flexion angles (<45°) during weight bearing exercises, using verbal, manual and visual cues as appropriate.
- Progress to single leg proprioceptive ex's as appropriate

Cardiovascular exercises:

- Static bike with resistance
- Incline treadmill walking (7% incline)
- Brisk walking programme over changing terrains as able
- ⚠ Cross trainer or rower from **12 weeks**
- ⚠ Stair/stepper machine from **16 weeks**
- ⚠ Breaststroke, side stroke and whip kicking action in pool until **16 weeks**

Criteria for progressing to Phase 3:

- No/minimal pain with phase 2 exercises
- No/minimal synovitis/effusion
- Full ROM
- Correct qualitative performance of phase 2 exercise
- Successfully weaned off brace
- Able to walk briskly 3-5km over changing terrains without pain

Lateral Collateral Ligament Reconstruction Protocol PHASE 3

THE KNEE RESOURCE
RELIABLE KNEE INFORMATION

Goals:

- **Maintain good quality movement patterns**
- **Improve strength and power/rate of force development**
- **Increase difficulty of neuromuscular and perturbation training**
- **Start jogging and sports specific training**

Post-operative time-based restrictions:

- Avoid hyperextension, external tibial rotation, posterior tibial sag and varus for **16 weeks**
- Avoid jogging/running until **20 weeks**
- Avoid functional testing (hop for distance, vertical hop, side hop) until **24 weeks**
- Progressive return to play if confirmation of stability on stress X-ray at **6 months**

Strength/power:

- Progressive loading for strengthening exercises
- Sports-specific progressions e.g. power development, double leg jumping and landing.

Neuromuscular training:

- Increase difficulty of neuromuscular and perturbation training (e.g. double leg jumps)
- Emphasise sports specific movements
- Maintain quality of movement/performance during strength and sports exercises

Cardiovascular exercise:

- Increase intensity and duration of cardiovascular exercise
- Build sports specific load regarding energy expenditure (aerobic, anaerobic)

Jogging/running:

- Graduated running program on treadmill/flat surface from **20 weeks:** start with 1-minute run, 4-minute walk (1:4) for 20 minutes.
- Increase running time by 1 minute each week with a subsequent reduction of walking by 1 minute (2:3, 3:2, 4:1, 5:0)
- Multi-plane agility once graduated running programme completed

Criteria for progressing to Phase 4:

- No/minimal pain with phase 3 rehabilitation
- Correct qualitative performance of phase 3 exercises
- Limb symmetry index (LSI) >80% for quads and hamstrings strength
- LSI >80% for hop battery tests (Gustavsson: hop for distance, vertical hop, side hop)

Lateral Collateral Ligament Reconstruction Protocol PHASE 4

Goals:

- **Sports specific drills and gradual return to play program**
- **Return to sport or physically demanding work**

Post-operative time-based restrictions:

- ⚠ Do not initiate progressive return to play programme until confirmation of restoration of lateral stability (<2mm side-side difference on varus stress X-ray) at **6 months** post-op.

Strength/power:

- Sports-specific progressions e.g. power development, jumping and landing.

Neuromuscular training:

- Increase difficulty of neuromuscular and perturbation training (e.g. single legged jumps)
- Introduce reactive/unanticipated movements
- Emphasise sports specific movements
- Maintain quality of movement/performance during strength and sports exercises

Cardiovascular exercise:

- Build sports specific load regarding energy expenditure (aerobic, anaerobic)

Sports specific training

- ⚠ Progressive return to play (e.g. grass/court surface, training with team) if confirmation of restoration of lateral stability (<2mm side-side difference on varus stress X-ray) at 6 months post-op.

Criteria for returning to play*:

- No knee pain with sports specific activities
- No giving way or fear of giving way during sports specific activities
- Active dynamic gait pattern and symmetrical jogging pattern
- Correct quality of performance with all sports specific activities
- Limb symmetry index (LSI) >90% for quads and hamstrings strength
- LSI >90% for hop battery tests (Gustavsson: hop for distance, vertical hop, side hop)
- Drop test with analysis of movement (trunk, knee valgus and knee flexion when landing)
- Use ACL-RSI to measure patient's psychological readiness/confidence in return to sports
- Restoration of lateral stability confirmed by varus stress X-ray
- Minimal 9 months since surgery

*Due to the lack of available evidence for LCL reconstruction, return to sports criteria is based on evidence following ACL reconstruction.

Originator: **Richard Norris, The Knee Resource**

References:

1. Grindem, Hege, et al. "Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL cohort study." *Br J Sports Med* 50.13 (2016): 804-808.

2. Kyritsis, Polyvios, et al. "Likelihood of ACL graft rupture: not meeting six clinical discharge criteria before return to sport is associated with a four times greater risk of rupture." *Br J Sports Med* (2016): bjsports-2015.

3. LaPrade RF, DePhillipo NN, Cram TR, Cinque ME, Kennedy MI, Dornan GJ, et al. Partial Controlled Early Postoperative Weightbearing Versus Nonweightbearing After Reconstruction of the Fibular (Lateral) Collateral Ligament: A Randomized Controlled Trial and Equivalence Analysis. Am J Sports Med. 2018;46(10):2355-65.

4. Lunden JB, Bzdusek PJ, Monson JK, Malcomson KW, Laprade RF. Current concepts in the recognition and treatment of posterolateral corner injuries of the knee. J Orthop Sports Phys Ther. 2010;40(8):502-16.

5. Rambaud AJM, Ardern CL, Thoreux P, Regnaux JP, Edouard P. Criteria for return to running after anterior cruciate ligament reconstruction: a scoping review. Br J Sports Med. 2018;52(22):1437-44.

6. van Melick, Nicky, et al. "Evidence-based clinical practice update: practice guidelines for anterior cruciate ligament rehabilitation based on a systematic review and multidisciplinary consensus." Br J Sports Med (2016): bjsports-2015.